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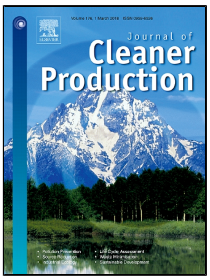

Sustainable Supply Chain Quality Management: A Systematic Review

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Sustainable Supply Chain Quality Management: A Systematic Review

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Abstract: Maintaining profitability measures while conducting business through environmentally and socially sustainable operations is an optimization challenge for organizations globally and for our society. Aiming to contribute to the research streams on this global challenge, this paper studies the state of the art literature on two management methodologies along with sustainability management from an integration perspective: quality management with its intraorganizational focus and supply chain management with its interorganizational view. The paper establishes key themes, trends and new avenues for research through a structured systematic review. The systematic review undertaken includes both descriptive analysis and thematic synthesis of state of the art quality management, sustainability and supply chain management integration literature. Integration synergies of quality and supply chain management were established including performance improvements and integration increasing the effect of both methodologies. Incorporation of sustainability into quality and supply chain management was identified to be a highly emerging area with multi-dimensional (financial, ecologic and social) approaches highly in need for more sustainable supply chains. Ultimately, a new, emerging research area was revealed: sustainable supply chain quality management. Although, several reviews were conducted on the quality, supply chain and sustainability management practices, this study is one of the very few, undertaken from the perspective of all three approaches and cumulative integration. This contribution provides an initial theoretical framework to guide future theory building on a fruitful research avenue.

Keywords: Sustainability; Quality management; Supply chain management; Sustainable supply chain quality management; ISO9001; Supply chain integration.

Paper type: Literature Review

Word Count: 11992 words

1. Introduction

Customers, legislation bodies and other interested parties are demanding higher business performance from organizations environmentally, socially and financially through responsible management of products, processes and services. Consequently, sustainability management (SM) is now a strategic parameter for the continuity of businesses, for satisfying the current society needs while not sacrificing the ability of meeting future needs. Achieving triple bottom line (TBL) performance which is hitting economical profitability measures while continuously improving on environmental and social impact levels through synergistic policies and strategies is an intricate matter for the industry and sustainability field (Rajeev et al., 2017).

Supply chain management (SCM) facilitates integration between the customer base, the distribution network, activities internal to firms and supply base, thus SCM practices highly influence organizational performance, sustainability performance and how this is perceived by the external stakeholders of firms. In the current trend of globalization and increasing competition, the strategic management of all external and internal stakeholders from raw material suppliers to end users is the primary focus for SCM, hence SCM is well positioned as an influential management method for sustainability performance of organizations (Reefke and Sundaram, 2016). Stemming from this strategic position of SCM and perceived direct impacts on key stakeholders, sustainability research streams incorporated triple bottom line considerations into SCM approaches, resulting in the highly growing research avenue of sustainable supply chain management (SSCM) (Ansari and Qureshi, 2015). Seuring and Müller (2008) articulated SSCM as "the management of material, information and capital flows as well as collaboration among firms along the supply chain while taking goals from all three dimensions of sustainable development, i.e. economic, environmental and social, into account which are derived from customer and stakeholder requirements". Türkay et al. (2016) point out the current research need to integrate all sustainability dimensions (historically economic dimension considered only) in supply chain design and planning for holistic sustainability assessments of supply chain strategies.

Stakeholder focus is at the center of quality management (QM), sharing the common end goal with SCM i.e. customer satisfaction (Talib et al., 2010). QM philosophies endeavor not only to consistently satisfy or exceed customer expectations but also to meet the expectations of other interested parties important for the continuity of organizations e.g. public, regulatory bodies, suppliers. Siva et al. (2016) highlighted the role of QM in sustainable development of organizations and recommended investigation of QM tools and techniques to facilitate business sustainability improvements. Supply chain quality management (SCQM) is an emerging research area, incorporating SCM and QM practices to achieve higher levels of customer satisfaction through enhanced collaboration within the network of firms and higher performing processes upstream and downstream to organizations, for higher quality products and services (Robinson and Malhotra, 2005).

1.1. Research Objectives

Based on the promising, state of the art research streams on the integration of the strategic management philosophies of QM and SCM with the sustainability imperative, this study aims to address the following research questions:

- What are the relationships between the quality, supply chain and sustainability management methodologies?
- What are the key integration issues of quality, supply chain and sustainability management methodologies including synergies, complications and further avenues for integration?

Our research motivation is to support and contribute to facilitation of continued research on the interdependencies between the influential methodologies of QM, SCM and SM with an in-depth study on the current literature on this emerging subject, which we believe will benefit the industry practitioners, the academic theoreticians and our society. Several recent literature reviews were conducted on the integration of SCM with sustainability (Rajeev et al., 2017; Reefke and Sundaram, 2016), QM with sustainability (Siva et al., 2016) and QM with SCM (Sharma et al., 2012; Talib et al., 2011), establishing knowledge bases on research themes, integration issues and synergies along with emphasis on further integration potential for firm performance and sustainability improvements. On the other hand, there are no, or highly limited reviews undertaken to date from the lens of all three (QM, SCM and sustainability), connecting links and exploring further synergies with a view to support future development of more holistic management models (as represented in Figure 1). The research objectives set out in this review stem from this principle of providing new insights and a collective perspective that has not yet been established in integration research streams that grew in isolation to each other.

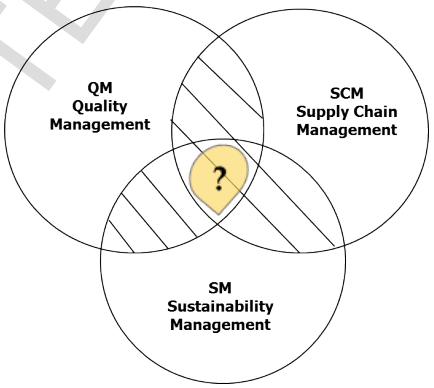


Fig. 1. The aim and scope of the literature review

The subsequent sections of this paper contain the following: Section 2 describes the systematic literature review research materials and methodology utilized; the descriptive outcomes of the research streams and results of thematic analyses are provided in Section 3 along with a theoretical integrated framework contribution; the implications of our findings are discussed in Section 4, discussing potential future avenues and limitations; and finally, conclusions are presented in Section 5.

2. Research Materials and Methods

The literature review process facilitates management of diverse intelligence pools such as academic inquiries set out in this study towards collectively investigating interdependencies between quality, supply chain and sustainability management (Tranfield et al., 2003). Traditionally, the narrative nature of the management research reviews brought together certain limitations including bias and lack of critical evaluation (Tranfield et al., 2003). Systematic reviews support establishment of solid knowledge bases, providing methodological rigor for particular research questions through transparent and extensive literature scanning, critical assessment and mapping out of the "knowns" and "unknowns" on the areas under investigation (Briner and Denyer, 2012). Insights acquired as a result of such reviews serve the purpose of stimulating future thinking and theory constructions in the strategic management areas under investigation (Webster and Watson, 2002). Stemming from the evidence in the management review literature, this paper follows the systematic review process to ensure a focused, transparent and reproducible evaluation on the research inquiries with high levels of reliability due to mitigated risk of bias introduction (Briner and Denyer, 2012; Kitchenham, 2004; Tranfield et al., 2003).

Systematic literature review along with descriptive and thematic analyses methodology has been deployed in recent studies with similar management integration focus such as lean management, supply chain management and sustainability (Martinez-Jurado and Moyano-Fuentes, 2014), lean and green (Garza-Reyes, 2015), lean, six sigma and sustainability (Cherrafi et al., 2016). Stages fundamental for a rigorous and complete systematic literature review were applied as follows: the research questions were formulated in phase 1; the relevant literature materials were located and identified in phase 2; the retrieved studies were sorted, assessed and confirmed for inclusion in the review as per the set criteria and research objectives in phase 3; relevant data and information were extracted from the materials along with descriptive and thematic analyses of the findings in phase 4; the findings were reported, disseminating key themes, future directions and an emerging integration research avenue exploration in phase 5 (Briner and Denyer, 2012; Kitchenham, 2004; Tranfield et al., 2003). The SLR phases followed are presented in Table 1.

Journal and conference publications within the scope of the review have been located and extracted through the utilization of aggregator databases including EBSCO (ebscohost.com), ISI Web of Science (wokinfo.com), Scopus (scopus.com) and in publisher databases including Elsevier (sciencedirect.com), Emerald Insight (emeraldinsight.com), Taylor & Francis (tandfonline.com), Springer (springlink.com), IEEE (ieeexplore.ieee.org). Although utilization of this level of database granularity (aggregator and publisher level) resulted in an overlap to a certain extent between the two levels of databases, this provided a validation of the aggregate searches conducted to ensure capturing of all relevant material in the literature. Peer reviewed journal publications and conference proceedings have only been included in the review to ensure inclusion of the most reliable materials and publications with remarkable managerial impact in the research fields under investigation (Saunders et al., 2015). Papers published in English language were included only.

The Kyoto Protocol implementation in 2005 has been noted as a remarkable milestone in global sustainability practices and sustainability research, most sustainability integration research in relation to the research agenda of this review stemming post this global initiative (Rajeev et al.,

2017). Robinson and Malhotra (2005), in their highly cited research paper, outlined the importance of supply chain and quality management integration and described 2005 and beyond as the inception of supply chain quality management (SCQM) field. Based on these key milestones on the quality, supply chain and sustainability management areas and to ensure capturing of state of the art literature, search period in this review has been set from 2005 to June 2017. To validate this stance, the literature between the 1990 - 2004 periods was searched however, this search did not identify materials relevant to the research questions of this review.

Table 1
SLR phases applied in the paper.

Phase 1 *Question Formulation*	**Research Questions** What are the relationships and key integration issues between the quality, supply chain and sustainability management methodologies including synergies, complications and further avenues for integration?
Phases 2 & 3 *Locating, Selecting and Evaluating Articles*	**Literature Databases** Key aggregator (e.g. EBSCO) and publisher (e.g. Elsevier) databases (peer reviewed only) **Search Period** 2005 to June 2017 (state of the art / post Kyoto Protocol (Rajeev et al., 2017)) **Inclusion Criteria** Sustainability, QM and SCM integration research that establish relationships, synergies and complications for integration in the organizational context. **Exclusion Criteria** QM, SCM and sustainability terms outside the business management and integration perspective. Integration of sustainability, QM and SCM with other models e.g. Lean. **Search Strings** SQM: "QM" + "Sustainability" SSCM: "QM" + "SCM" + "Sustainability" SCQM: "SCM" + "Sustainability" SSCQM: "QM" + "SCM" + "Sustainability" and all related keywords
Phase 4 *Analysis*	**Methods for analysis** Descriptive analysis and thematic synthesis.
Phase 5 *Reporting*	**Reporting of findings** Findings reported in descriptive and analytic (thematic synthesis) components.

All research streams studying the relationships, synergies, complications from an integration perspective among the three management models under investigation (QM, SCM and SM) have been included. Taking into consideration the highlighted need in the literature for the incorporation of triple bottom line into management practices and decision making, sustainability literature on all three sustainability dimensions (e.g. economic, ecologic and social) have been included (Beske and Seuring, 2014; Reefke and Sundaram, 2016; Winter and Knemeyer, 2013). Quality management literature included captured both softer aspects of QM such as total quality management principles (e.g. management commitment and support, customer focus etc.) (Talib et al., 2011) and harder aspects such as quality management systems (e.g. ISO9001, Baldridge etc.) (Shalij et al., 2009). The articles considered to be irrelevant and outside the scope of this study were excluded, such as papers related to "water or air quality management and sustainability" where the sustainability,

quality and supply chain terms were quoted outside the business management and integration perspective. Studies with reference to integration of sustainability, quality and supply chain management with other business models such as lean manufacturing were also excluded from this study to ensure focus and rigor on the specific relationships between the QM, SCM and SM management models under investigation.

Considering the current knowledge bases offered by the extant review articles on SSCM (Rajeev et al., 2017), SQM (Siva et al., 2016) and SCQM (Sharma et al., 2012; Talib et al., 2011), higher level search strings were set to extract an overview of the latest themes and integration issues fundamental to these research lines. Nevertheless, the search protocol adopted identified research materials covering a wide range of sustainability, QM and SCM integration issues not limited to but including green supply chain management, quality management based eco-design, planning of sustainable supply chains, enablers of SSCM, performance measurement of SSCM and design of quality management system based supply chains. Therefore, below search strings were utilized for development of SQM, SSCM and SCQM research lines, with a view to guide our research journey towards a more holistic integration perspective:

Search 1 - SQM: "Sustainability" AND "Quality Management";
Search 2 - SSCM: "Sustainability" AND "Supply Chain Management"
Search 3 - SCQM: "Quality Management" AND "Supply Chain Management"

To complement extant review studies in the literature and to develop a collective perspective of sustainable supply chain quality management (SSCQM) in line with the research objectives of this study, an in-depth search was undertaken towards revealing this relatively unexplored territory as per the search protocol below:

Search 4 - SSCQM: "Sustainability" AND "Quality Management" AND "Supply Chain Management" including keywords fundamental to each research line

Considering that such a collective review approach is highly limited in the current literature, the decision was taken to expand the SSCQM search, incorporating QM, SCM and sustainability as well as their subsets and related keywords. Sustainability and SCM keywords utilized in the SSCQM search protocol included “sustainable or green supply chain”, “sustainable or green or environmental purchasing”, “sustainable or green design”, “sustainable or green logistics”, “reverse logistics”, “closed loop supply chain”, “sustainable or green manufacturing”, “sustainable or green or environmental supplier selection” (Rajeev et al., 2017). The keywords adopted for QM included “Six Sigma”, “quality management systems”, “total quality management”, “ISO9001”, “EFQM”, “Baldridge Model”.

For synthesis and analysis of qualitative information, several methods are available in the literature such as qualitative meta-summary, meta-ethnography, qualitative meta-analysis, grounded theory, content analysis and thematic synthesis (Barnett-Page and Thomas, 2009; Thomas and Harden, 2008). As it provides a structured method for interpretation of thematic information

and it facilitates development of a holistic view on the literature materials under review, the decision was made to adopt thematic synthesis method in this study (Barnett-Page and Thomas, 2009). Thematic synthesis method was also successfully applied in similar studies, facilitating extraction of key thematic information during the systematic review of management integration literature (Garza-Reyes, 2015).

A database in MS Excel was formed to sort, codify and categorise articles included in this review, clustering the studies under SQM, SCQM, SSCM and SSCQM categories for descriptive analysis and thematic synthesis. To gather descriptive data, key descriptive information including publication date (year), country of the main author, application area and business sector (manufacturing, energy, theoretical etc.), research methodology applied (case study, mixed etc.) and sustainability dimensions addressed (social, economic, ecologic) were extracted from the publications and recorded on the database developed.

For thematic analyses, the main findings such as key relationships proposed (for conceptual studies) and/or proven (for empirical studies) and key discussion areas were noted for each article included in the review under each category (SQM, SCQM, SSCM and SSCQM). To mitigate the risk of miscomprehension and subjectivity, this stage has been undertaken by both authors, conducting joint reviews for finalisation of each classification and coding stage. The key elements of the topics have been identified, resulting in the initial classifications and coding. Further coding and associated classifications were generated from the higher level classifications, finally resulting in the concept maps for SCQM and SSCM, illustrating concentrations and common themes in relation to particular research lines (Barnett-Page and Thomas, 2009; Thomas and Harden, 2008). Due to the relatively lower number of articles identified, detailed discussions with reference to each paper under the SQM and SSCQM categories have been provided.

3. Results and Findings

Following the outlined SLR protocol, the articles identified were filtered, sorted and confirmed for inclusion in the review through an iterative selection process as presented in Fig. 2. As part of this process, duplicates were removed, eligibility confirmed from abstracts and the full text of outstanding articles reviewed in the light of the research questions for final decision on inclusion for descriptive and thematic analyses, in relation to the integration areas under investigation (Moher et al., 2009).

The 93 articles selected and confirmed as relevant as per the SLR protocol for the research lines are visually represented in Venn Diagram form in Fig. 3 in line with the research objectives outlined in Section 1.1. The 83% of the literature identified were down to SCQM literature (43%) and SSCM literature (40%), highlighting the integration research focus in these emerging research streams. On the other hand, only 12% of the articles identified were under SQM category, pointing out limited research in this area with potentially unexplored integration synergies. The full list of articles included in this review is provided in the Appendix section.

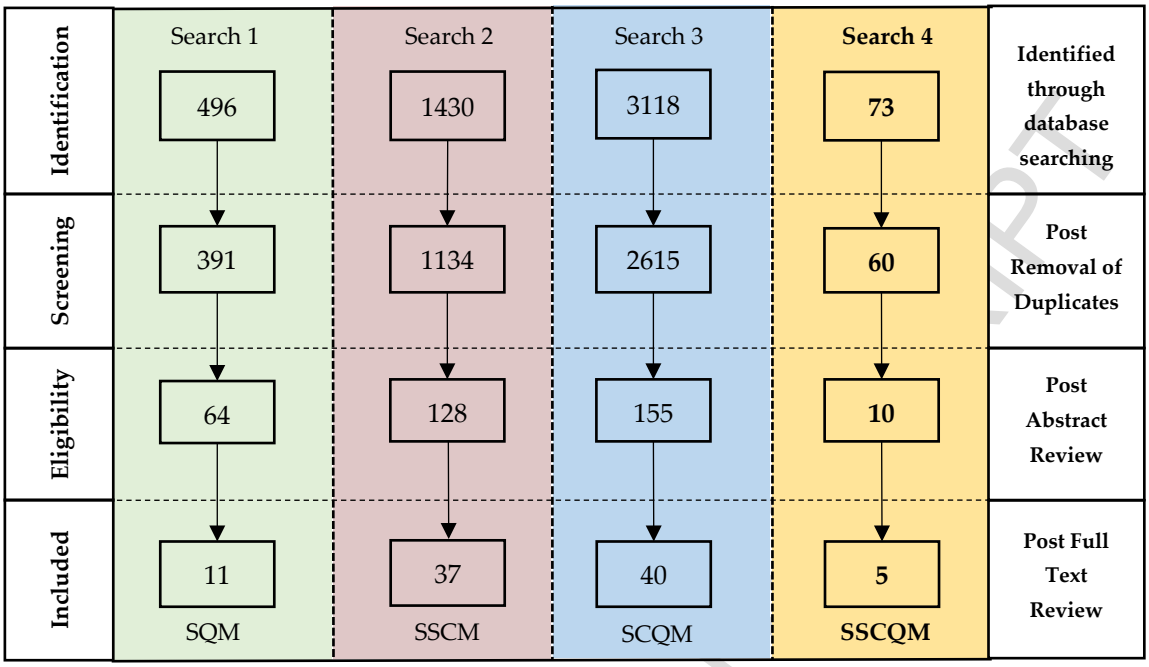


Fig. 2. Overview of paper identification, selection and inclusion process (Moher et al., 2009).

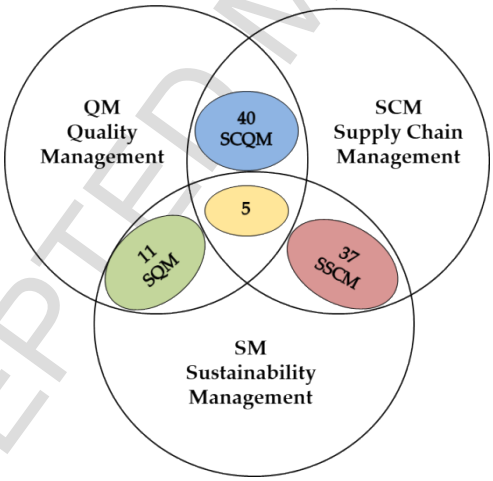


Fig. 3. Representation of number of articles identified in QM, SCM and SM Integration literature between the search period 2005 - June 2017

3.1. Descriptive Analysis

An analysis of the distribution of papers against the years was undertaken, studying the trend of research streams from 2005 to 2017 and the results presented in Fig. 4. It was seen that the 74% of the materials were published since 2010 with the years 2015 (12%) and 2016 (14%) having the highest number of publications, which highlights the emerging and growing nature of the research fields. Moreover, 6 articles have already been identified in the first half of year 2017 (6%), that

further predicts another year of growth for the research streams, in particular for the sustainability research streams. Considering the growing external pressures on organizations from legislative bodies, customers and demands of our society for sustainability, the research streams studying incorporation of sustainability into fundamental business practices is expected to increase further. This projection is also in line with the findings of other authors that studied integration of sustainability with other management systems such as Garza-Reyes (2015) and Cherrafi et al. (2016).

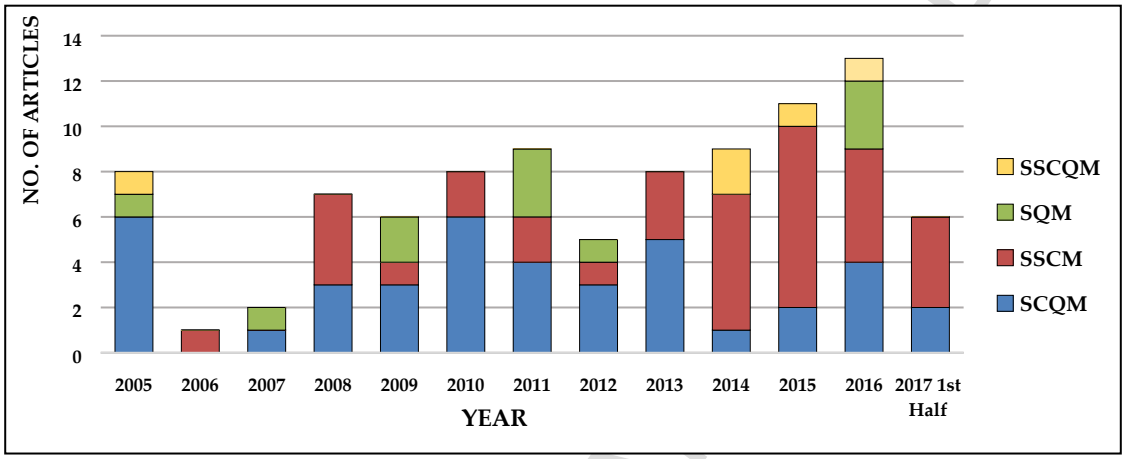


Fig. 4. Number of publications per year

The geoghraphical locations where the publications were produced are demonstrated in Fig. 5. This information was produced based on the location information of the main authors of the publications reviewed. The analysis revealed that the most research for the research streams under review were conducted in USA with 15% of publications identified in this geographical area although the majority of the work (64%) carried out in this region were studying the integration of SCM and QM methodologies (SCQM). India and China were also popular regions for SCQM research with 18% and 15% of SCQM studies carried out in these regions including a range of empirical and theoretical modelling papers. With reference to sustainability research, it was noted that 57% of the research was conducted in the European Union countries with Germany equating to the 21% of all sustainability research identified. This finding reflects the remarkable role of developed, EU countries in driving sustainable development and incorporation of sustainability into organizational management practices. Although 11% of the sustainability research was observed to take place in India, we encourage researchers in developing countries to take part in future research in integration of SM, QM and SCM which is expected to benefit our society and organizations in all regions.

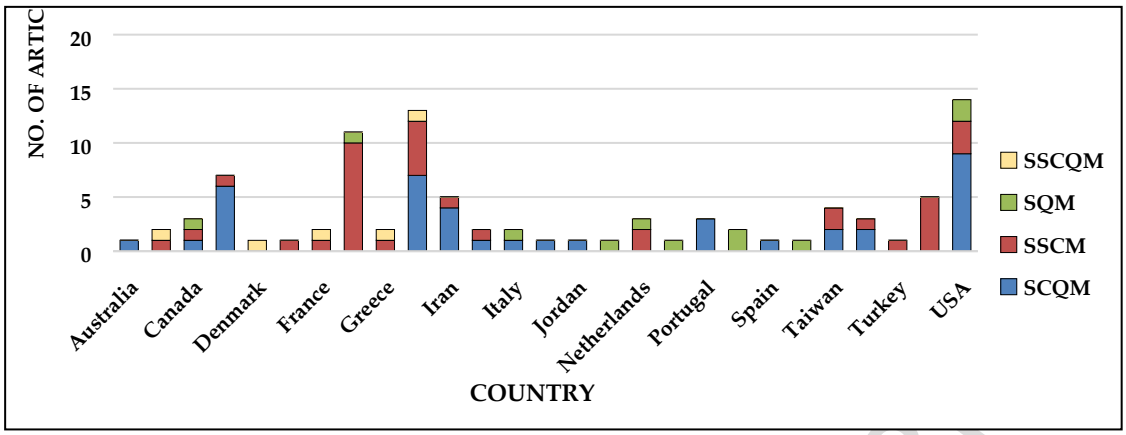


Fig. 5. Number of publications per geographical area

As shown in Fig. 6, a significant portion (45%) of the research streams included in this review were seen to be "theoretical" studies. The articles classified under this category include literature reviews and conceptual studies, where the information presented, and relationships identified have not been empirically evaluated with data gathered from industrial contexts. This finding agrees with the suggestions of SQM (further empirical studies are required on the effect of quality management systems and practices on sustainability performance (Kuei and Lu, 2012; Siva et al., 2016)), SSCM (more focus on industry specific, empirical studies is required (Rajeev et al., 2017)) and SCQM (conceptual frameworks integrating QM and SCM are required to be validated through empirical investigations in different industries (Quang et al., 2016)) literature and highlights the clear need for further empirical research on these areas. On the other hand, the empirical studies reviewed utilized data mainly from multiple business sectors (17%) and from the automotive sector (10%). All in all, it was observed that the manufacturing industries are at the forefront of QM, SCM and sustainability integration research, most of the empirical studies focusing on the organizational developments in the manufacturing orientated sectors (e.g. automotive, chemical, electronics etc.). This reflects the inherent pressures on the manufacturing industries for higher performing, cleaner and more responsible products, services, processes and supply chains (Cherrafi et al., 2016; Garza-Reyes, 2015).

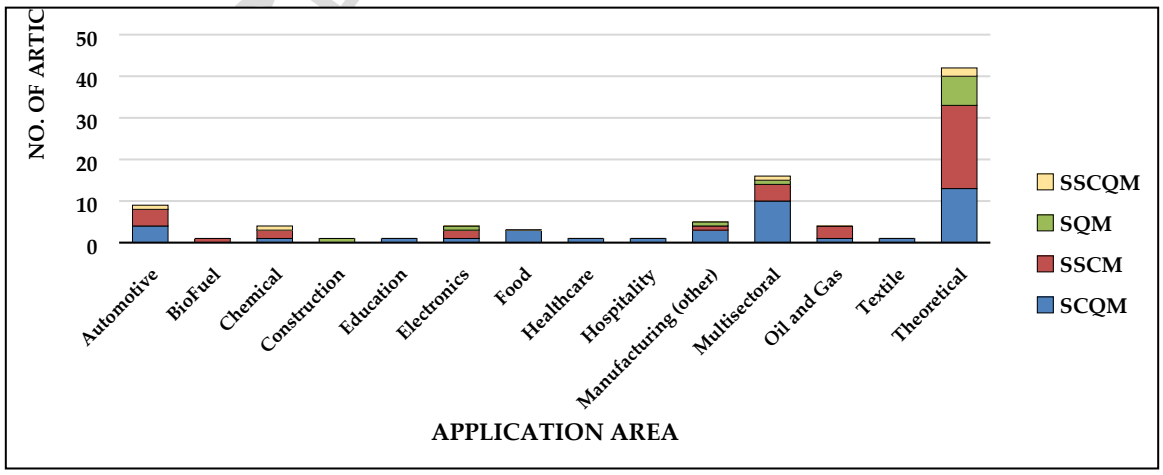
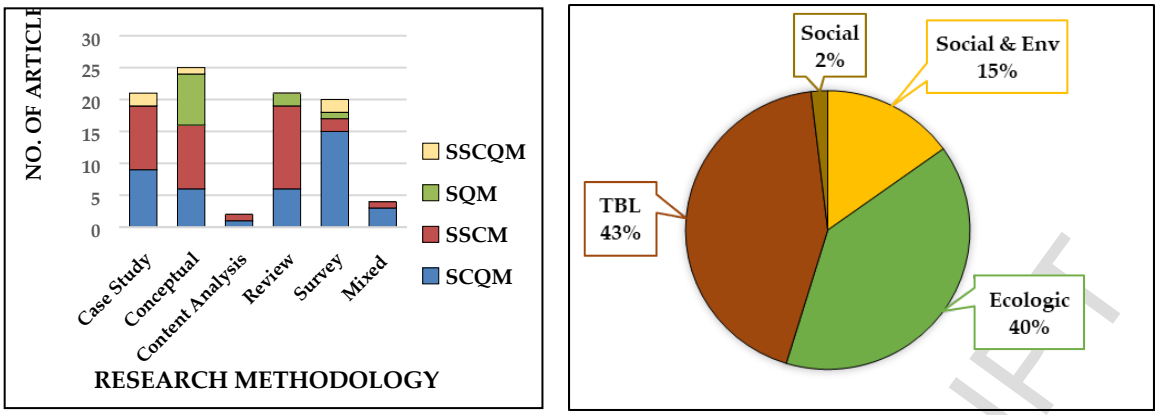


Fig. 6. Number of publications per application area



(a) (b)

Fig.7. (a) Number of publications per research methodology applied (b) Distribution of sustainability research streams against the three pillars of sustainability (TBL)

Fig. 7 (a) presents the distribution of publications with reference to the research methodology applied. Conceptual contributions were noted as significant with 27% of papers applying this method and proposing innovative frameworks for integration of QM, SCM and SM including integrated tools, techniques and practices (SSCM in particular). Literature review (including SLR) was further seen to be a common research method adopted, 23% of papers utilizing this methodology to facilitate continued research and theory building on integration. Case studies of qualitative nature were the most popular empirical assesment method (23%) although the quantitative surveys were also widely used (22% of papers). Finally, studies that utilized mixed methods (qualitative and quantitative) only equated to a low percentage (5%) even though the significant benefits offered by such research methodology for management research studies (Tranfield et al., 2003). Leech and Onwuegbuzie (2009) highlighted that more balanced assessments with enhanced research data results certainty and validity can be achieved through triangulation of qualitative and quantitative methods. Based on this, it is argued that empirical research studies that adopt both qualitative and quantitative methods is likely to provide further insights and enhanced confidence levels for the integration research lines.

Fig. 7 (b) demonstrates the distribution of the publications versus the sustainability dimensions addressed in the publications. Only 43% of the studies adopted the "holistic" view to sustainability and took into consideration all three pillars (TBL), which resonates with the current consensus in the literature that the collective view on triple bottom line (total integration of financial, ecologic and social thinking into internal operations and supply chains) still highly remains as a fundamental challenge for future sustainability research and the industry (Beske and Seuring, 2014; De Brito and Van der Laan, 2010; Reefke and Sundaram, 2016; Winter and Knemeyer, 2013). A significant portion (15%) of sustainability research utilized an integrated approach, addressing both environmental and social sustainability dimensions, assuming that the economic sustainability is the most developed pillar of sustainability due to historical profitability reasons in industry with highly limited research focus noted on the economic dimension (Gold and Schleper, 2017). On the other hand, environmental sustainability dimension, green supply chain management (GSCM) literature in particular, was observed to be the focal research line among the uni-dimensional

sustainability articles. The 40% of articles identified in this SLR were noted to study various aspects of incorporating environmental sustainability into QM and SCM considerations. This finding is also in line with the findings of Siva et al. (2016) that conducted a literature review specifically on QM and sustainable development.

3.2. Thematic Synthesis and Analysis

3.2.1. Supply Chain Quality Management - SCQM Research Themes

The focal research streams and themes surrounding the SCM and QM integration research are presented in Fig. 8 along with weightings of recurrence (percentage of papers addressing the identified themes). In general, the literature is in agreement on synergies and benefits of integration of supply chain and quality management methodologies with 80% of SCQM literature highlighting various benefits that would be obtained from integrated and coherent approaches. In particular, the literature highlighted four main advantages received from integration as: enhanced supply chain integration (discussed in 60% of SCQM articles), improved customer satisfaction (discussed in 35% of SCQM articles), enhanced firm performance (33% of SCQM articles) and improved supply chain performance (23% of SCQM articles). This finding is demonstrated in Table 2 against the associated SCQM literature.

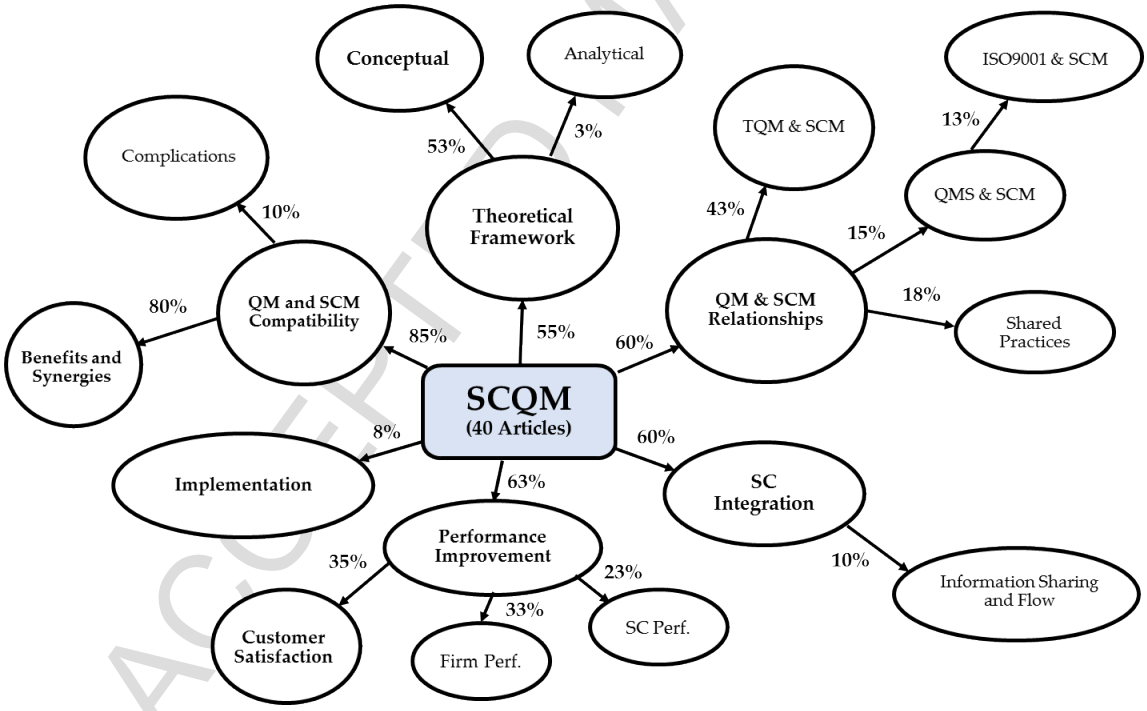


Fig. 8. Concept map of SCM and QM integration (SCQM) literature, demonstrating various research streams identified and their distributions

The integration of quality management that seeks internal (executives and employees within boundaries of organisations) participation and supply chain management that seeks external (suppliers and customers) partnerships results in a synergistic, collaboration and coordination

environment among all chain links with a holistic supply chain view (Vanichchinchai and Igel, 2009). As the ultimate goal of both QM and SCM is "customer satisfaction", the integration enhances the influence of both, resulting in enhanced organisational customer satisfaction levels (Mahdiraji et al., 2012). Through implementation of practices shared among QM and SCM such as continuous improvement and leadership, organisational performance is improved (Azar et al., 2010; Fernandes et al., 2017; Kaynak and Hartley, 2008). Supply chain performance is highly enhanced through QM principles and continuous improvement concepts deployment across the supply chain network (Terziovski and Hermel, 2011). Stemming from the facilitation of collaboration across the supply chain network through SCQM approaches, several authors further highlight information sharing and flow across the supply chain as an integral factor for supply chain performance (Jiang et al., 2010; Quang et al., 2016; Sarrico and Rosa, 2016).

Table 2
Benefits of integrating quality and supply chain management (SCQM).

Benefit	Authors
Supply chain integration (increased supply chain collaboration)	(Carmignani, 2009; Casadesús and de Castro, 2005; Chadha and Gagandeep, 2013; Chen et al., 2014; Flynn and Flynn, 2005; Fynes et al., 2005; Gu et al., 2017; Jiang et al., 2010; Kannan and Tan, 2005; Kaynak and Hartley, 2008; Kuei et al., 2011; Lou et al., 2009; Mahdiraji et al., 2012; Mellat-Parast, 2013; Quang et al., 2016; Robinson and Malhotra, 2005; Shalij et al., 2009; Sharma et al., 2012; Talib et al., 2011; Terziovski and Hermel, 2011; Vanichchinchai and Igel, 2009; Wang et al., 2010; Zhong et al., 2016)
Improved customer satisfaction	(Casadesús and de Castro, 2005; Chadha and Gagandeep, 2013; Fynes et al., 2005; Gu et al., 2017; Jiang et al., 2010; Kannan and Tan, 2005; Lin et al., 2013; Mahdiraji et al., 2012; Mellat-Parast, 2013; Quang et al., 2016; Robinson and Malhotra, 2005; Talib et al., 2011, 2010; Vanichchinchai and Igel, 2009; Zeng et al., 2013)
Improved firm performance	(Azar et al., 2010; Azizi et al., 2016; Foster and Ogden, 2008; Lin et al., 2013; Mahdiraji et al., 2012; Mellat-Parast, 2013; Quang et al., 2016; Sarrico and Rosa, 2016; Shalij et al., 2009; Sharma and Modgil, 2015; Talib et al., 2011, 2010; Zhong et al., 2016)
Improved supply chain performance	(Flynn and Flynn, 2005; Jraisat and Sawalha, 2013; Lin et al., 2005; Mahdiraji et al., 2012; Mellat-Parast, 2013; Sarrico and Rosa, 2016; Terziovski and Hermel, 2011; Vanichchinchai and Igel, 2010; Zhong et al., 2016)

On the other hand, a few complications for integration were established. Siddiqui et al. (2012), in an empirical study conducted on oil and gas supply chain, did not observe any significant relationships between QM and SCM practices. Talib et al. (2010) argued that although certain benefits, the integration of QM and SCM results in complexity in both the business processes and the firm structure. Vanichchinchai and Igel (2009) discussed that potential conflicts may arise for integration as the main focus of QM is internal participation from in-house team members whereas SCM seeks for inter-organisational engagement and partnerships. Vanichchinchai and Igel (2009) further highlight that conflicting primary goals of QM (specification based performance - quality)

and SCM (time based performance - delivery) can act as a complication for integration and collective implementation.

Quality management literature in the context of supply chain management was grouped into two research streams: total quality management (TQM) practices – SCM relationships (43% of SCQM literature) and quality management systems (ISO9001 and Baldridge) - SCM relationships (15% of SCQM literature). Vanichchinchai and Igel (2009) and Talib et al. (2010) confirm the strong correlation between TQM and SCM practices. Shared TQM and SCM practices are confirmed as "leadership, customer focus and supplier quality management" (Azar et al., 2010; Kaynak and Hartley, 2008). Carmignani (2009) and Shalij et al. (2009) identified mediating relationships between ISO9001 and SCM, proposing expansion of internal quality management systems (QMS) across the entire supply network through a cooperating framework, exploiting the limitations of the current system for supply chain performance improvements. Casadesús and de Castro (2005) and Chadha and Gagandeep (2013) supported ISO9001 based SCQM systems, pointing out synergistic incorporation of QMS and SCM through a supply network fully engaged in continuous improvement.

3.2.2. Sustainable Supply Chain Management - SSCM Research Themes

Fig. 9 schematically represents the key reccurring themes for supply chain management and sustainability (SSCM) literature reviewed along with their weightings. One of the main themes in the SSCM literature was noted as supply chain integration, which is established as a key factor for implementation, execution, effectiveness and improvement of sustainable supply chain management. The supply chain integration brings together collaboration, coordination, information sharing, trust and enhanced relationships in every segment of the supply chain network including multi-tier suppliers, focal organisations and customers. Integration and collaboration can be defined as the first building block of the SSCM philosophy (Beske and Seuring, 2014; Liebetruth, 2017; Rajeev et al., 2017).

The literature pointed out "leadership" as another crtical success factor of SSCM (Agi and Nishant, 2016; Ansari and Qureshi, 2015; Luthra et al., 2016, 2015; Reefke and Sundaram, 2016; Somsuk and Laosirihongthong, 2016). The commitment and support from the senior management of organizations in each supply chain link is essential for the efficiency and effectiveness of SSCM. The leadership across the supply chain provides the vision, the engagement for incorporation of triple bottom line into supply chain decision making, reinforces collaboration, monitors sustainability performance against objectives and ensures sustainability performance improvement. Thus, leadership, senior management commitment and support for SSCM activities can be defined as the second building block of SSCM implementation and deployment.

External stakeholder requirements and pressures were seen as the main driver and motivator for implementation of SSCM and environmental supply chain management (GSCM) practices (Lin, 2013; Luthra et al., 2016; Seuring and Müller, 2008; Somsuk and Laosirihongthong, 2016; Türkay et al., 2016; Yu Xia, 2011; Zhu et al., 2006). Legislative bodies such as the governmental regulators were identified as a highly influential factor for GSCM deployment (Luthra et al., 2016) whereas, Türkay et al. (2016) concluded that legislation is imperative for integration of social and

environmental considerations into SCM. Seuring and Müller (2008) described market and legislative pressures as key drivers for SSCM, Lin (2013), Somsuk and Laosirihongthong (2016) and Zhu et al. (2006) resonating with the same for GSCM.

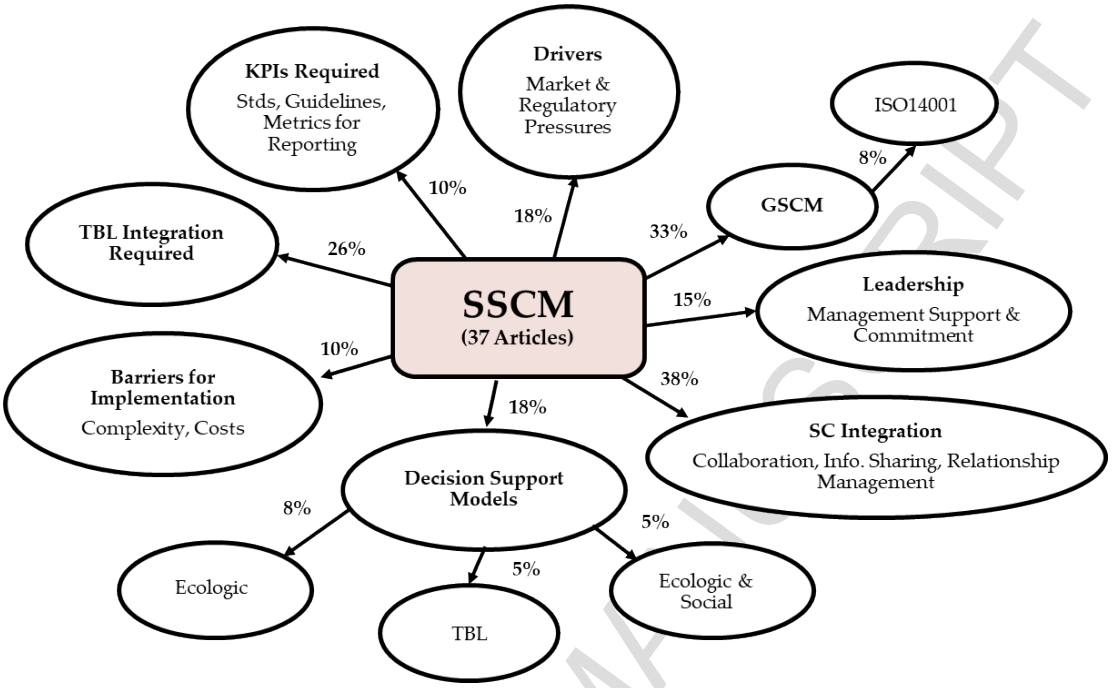


Fig. 9. Concept map of the supply chain and sustainability integration (SSCM) literature, demonstrating various research streams identified and their distributions

The integration of environmental sustainability into supply chains received significant attention in the literature with 33%. The implementation of ISO14001 environmental management system and use of certified suppliers were identified as influential factors for GSCM implementation and effectiveness (Agi and Nishant, 2016; Ansari and Qureshi, 2015). Govindan et al. (2014) supported this view, however put forward the argument that ISO14001 implementation, although being an influential factor for environmental sustainability, does not have a significant impact on overall supply chain sustainability performance due to its lack of influence on economic and social dimensions.

In general, a consensus has been reached in SSCM literature over a period of time that the incorporation of all three pillars of sustainability (TBL) into SCM is required (Ansari and Qureshi, 2015; Ashby et al., 2012; Awudu and Zhang, 2012; Beske and Seuring, 2014; Gold and Schleper, 2017; Reefke and Sundaram, 2016; Türkay et al., 2016; Winter and Knemeyer, 2013). Considering the traditional focus of organizations on the economic dimension (Gold and Schleper, 2017) and the extant research concentration on the environmental issues (GSCM), the integration of triple bottom line and multi dimensional approaches into the supply chain thinking will provide more balanced, holistic and effective SSCM implementation, mitigating the risk of favouring certain dimensions over the others.

Several decision making support models were designed by the literature to facilitate measurement and integration of sustainability into supply chain management activities although only two papers considered all three pillars of sustainability (Chardine-Baumann and Botta-Genoulaz, 2014; Schaltegger and Burritt, 2014). Moreover, several authors emphasized the importance of key performance indicators (KPIs) for supply chain sustainability performance in the implementation of SSCM practices, highlighting the current absence of guidelines, metrics and standards for measurement, monitoring, reporting and improvement of supply chain triple bottom line performance (Ansari and Qureshi, 2015; Rajeev et al., 2017; Schaltegger and Burritt, 2014; Wan Ahmad et al., 2016). Wan Ahmad et al. (2016) articulated that such measurable indicators would enable organizations to assess their progress and impact of their strategies, establish priorities, facilitate continual improvement thus, contribute to effectiveness of SSCM activities.

On the other hand, several complications and barriers for integrating triple bottom line considerations into supply chain management are discussed (Ansari and Qureshi, 2015; De Brito and Van der Laan, 2010; Seuring and Müller, 2008; Silvestre, 2015). Seuring and Müller (2008) argued that SSCM implementation and deployment face significant resistance in organizations due to additional cost implications, inherent complexity and interorganizational communication difficulties. De Brito and Van der Laan (2010) articulated further on the complexity challenges associated with SSCM approaches, arguing that the multi dimensional (financial, ecologic and social) view introduced by SSCM brings together multiple objectives and agendas with the potential risk of inter and intraorganisational conflicts.

3.2.3. Sustainable Quality Management - SQM Research Themes

Fundamental quality management concepts including Deming's Plan-Do-Check-Act (PDCA) cylic management tool, quality function deployment, continuous improvement, customer focus and stakeholder management were identified to be synergistic with sustainability management (Alemam and Li, 2016; Kuei and Lu, 2012; Rusinko, 2005; Siva et al., 2016; Zink, 2007). PDCA cycle with its iterative improvement framework, was adapted for sustainability (TBL) practice implementation and change management facilitation by Kuei and Lu (2012), Asif et al. (2011) and Rusinko (2005).

Siva et al. (2016) and Zink (2007) highlighted that QM, with its inherent focus on stakeholder (customers, regulatory bodies and other interested parties to whom the business is dependent for existence) management, supports sustainable development. This is achieved through managing the needs and expectations of stakeholders that are influential for the continuity of the organization, that results in increased sustainability management capabilities and performance. Siva et al. (2016) further established the support of quality management for sustainability through integrated management systems and environmental management systems. Quality management system is argued to support integration of other management systems (environmental, OH&S), enabling minimisation of redundancies and efficiency enhancements. Quality management principles, tools and practices including continuous improvement and relationship management are argued to be shared and in synergy with environmental management principles, thus supporting environmental sustainability in organizations (Siva et al., 2016).

Maletič et al. (2011) outlined the four primary characteristics of SQM as "green development and environmental aspects, top management commitment, employee support, corporate social responsibility and local community engagement". Srdić and Šelih (2011) developed an integrated quality and environmental sustainability performance management framework for sustainable development of construction projects, consisting of three key elements: "building level (quality and sustainability assessment), process/project level (established QMS and EMS) and product level (conformance through environmental product declaration)". Aquilani et al. (2016) integrated TQM and TBL, redefining critical success factors at their interface with a view to foster organizational sustainability through QM processes and value co-creation.

Alemam and Li (2016) integrated quality function deployment (QFD) tool with functional design analysis through relational matrices for environmental sustainability improvements. The integration of the QFD tool faciliated the embedding of eco-design principles into the new product development process, enabling design of more environmentally sustainable products. Utne (2009) also assessed eco-QFD concept for environmental sustainability improvement of fisheries, concluding that the structure introduced by such an integrated system facilitates stakeholder requirement analysis with potential improvements in sustainability decision making. Francis (2009) established a positive link between TQM and design for environment, proposing incorporation of environmental considerations into product development process as part of TQM for sustainable development.

On the other hand, Asif et al. (2011) reviewed EFQM and Baldridge models from the lens of TBL, identifying that both models do not adequately address the dynamic nature of the multi-dimensional sustainability bottom line requirements. Stemming from this observation, it was concluded that the sustainability indicators and reporting needs are required to be embedded within both QM models Asif et al. (2011). An integrated management framework was proposed using EFQM and Baldridge models to incorporate TBL aspects and indicators into business processes from stakeholder requirements, with a view to drive continual sustainable development through PDCA cycle (Asif et al., 2011).

3.2.4. Sustainable Supply Chain Quality Management - SSCQM Research Themes

Five studies were identified to associate relationships and synergies between QM, SCM and sustainability, justifying categorization under SSCQM with particular focus in this review (Agi and Nishant, 2016; Dubey et al., 2015; Fassoula, 2005; Govindan et al., 2014; Jabbour et al., 2014). The distribution of these studies in relation to TBL are illustrated in Fig. 10. Agi and Nishant (2016), Dubey et al. (2015) and Jabbour et al. (2014) investigated relationships between GSCM, QM and environmental sustainability. Jabbour et al. (2014) modelled QM as "ISO9001 implementation; TQM implementation; and certification of suppliers based on quality criteria" and measured the organizational green performance as "the emission of waste; compliance with environmental legislation; company environmental reputation; and company overall environmental performance". The empirical survey evidence sought from Brazilian companies concluded that QM establishes the foundations for environmental management and its maturity in businesses, which subsequently

facilitates green supply chain management practices and environmental performance. Agi and Nishant (2016) established "relationship between supply chain members, management commitment and application of QM principles" as influential factors for GSCM implementation and environmental sustainability, based on the opinions of the SCM experts in the Middle East region. Dubey et al. (2015), in their empirical study on Indian rubber goods manufacturing industry, further evidenced that "supplier relationship management (SRM) and TQM, influenced by leadership practices and moderated by the institutional pressures (e.g. normative and customer pressures), positively impact environmental performance and facilitate establishment of greener supply chain networks. Fassoula (2005) constructed a business diagnostic tool on the basis of a positive relationship between the SCM practice "reverse logistics management" (management of materials, inventory, products and information from the point of use to their origin for value recapturing) and quality management, integration increasing the effect of both for improvements in environmental sustainability and organizational competitiveness.

Nevertheless, although providing valuable insights to the environmental sustainability knowledge base, these studies entail the limitation of not including the social and economic dimensions of sustainability, lacking the full triple bottom line view which is required for true sustainable development (Agi and Nishant, 2016; Dubey et al., 2015; Fassoula, 2005; Jabbour et al., 2014). Govindan et al. (2014), during their case study on Portuguese automotive sector, concluded positive associations between TQM, SCM practices and supply chain triple bottom line sustainability performance and can be noted as the first paper to link QM, SCM and TBL incorporating the full supply chain view. However, the empirical evidence in this study is only limited to the perceptions of a specific business sector in a specific geographical region.

All in all, the knowledge base on the emerging SSCQM field is seen to be highly limited although its high potential. Many future research opportunities can spring for exploration of this fruitful area, investigating relationships between various QM approaches (ISO9001, EFQM, Six Sigma), SCM approaches and triple bottom line, expanding on the current limited empirical coverage on business sectors and geographical regions.

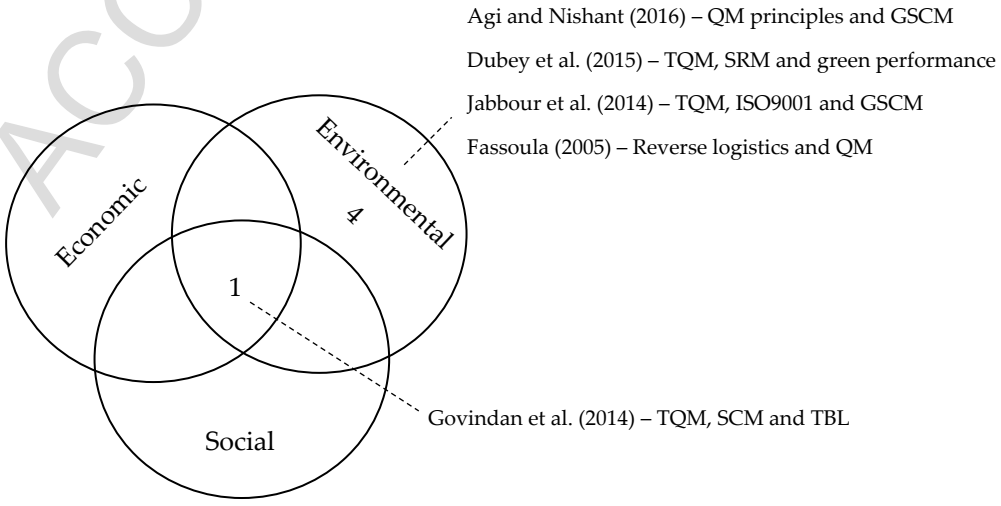


Fig.10. Distribution of 5 SSCQM Papers against triple bottom line

3.3. Sustainable Supply Chain Quality Management - a theoretical framework proposal

3.3.1. Structural model integrating QM (ISO9001), SCM (Integration) and Sustainability

The only study currently identified in the literature to study links between QM, SCM and TBL, conducted their investigation from the perspective of TQM, implying further potential integration opportunities with other QM practices such as ISO9001, Baldridge, EFQM and Six Sigma (Govindan et al., 2014). ISO9001 quality management system, with over a million organizations certified in over 170 geographical areas, is a global QM standard widespread in various industries, thus applicable to a higher percentage of the organizational population in relation to other QM approaches such as Six Sigma, Baldridge and EFQM (ISO, 2015). With a view to address the identified gaps in the SQM and SSCQM literature, further integration potential between other QM approaches, SCM and TBL was taken forward. The integration opportunity of ISO9001 with SCM and sustainability management was noted to be widely recognized by the SCQM, SQM and SSCM literature. Robinson and Malhotra (2005) discussed that ISO9001 with its supply chain process orientation, is an essential avenue for future SCQM research. Carmignani (2009) proposed development of a framework where ISO9001 quality management system is strengthened through expansion and application across the supply chain, overcoming limitations inherent with the traditional internal view of QM. Rusinko (2005) recommended investigation of ISO9001 and quality management systems as a key future research avenue due to support and synergy potential for implementation of sustainability in organizations. Agi and Nishant (2016) identified quality management system (ISO9001) implementation in organizations as a highly influential factor for green supply chain management implementation that seeks to achieve a more environmentally sustainable supply chain.

ISO9001:2015 quality management framework has seven fundamental principles, which are also being accepted as core principles by other management system frameworks such as the organizational health and safety standard, ISO45000 (ISO, 2015; Murray, 2016). These key quality management principles of "leadership, process approach, evidence based decision making, improvement, engagement of people, customer focus and relationship management" were expanded to the supply chain concept, incorporating key SCM principle of "supply chain integration". These key QM and SCM principles are proposed to be associated with economic, ecologic and social dimensions of sustainability.

Chardine-Baumann and Botta-Genoulaz (2014) characterized three-dimensional sustainability performance as "reliability; responsiveness; flexibility; financial performance; quality" for economic, "environmental management; use of resources; pollution; dangerousness; natural environment" for ecologic and "working conditions; human rights; societal commitment; customers issues; business practices" for social. A positive relationship between the seven ISO9001:2015 principles and economic sustainability performance is proposed for all principles, considering the widely accepted positive influence on reliability, financial performance and quality through meeting and/or exceeding customer expectations across the supply chain network. Latest empirical

findings of Chang et al. (2016) further evidence supply chain integration principle's positive contribution to financial performance of firms and to economic sustainability. The supply chain network is modelled as suppliers (multi-tier), focal organization and customers (Seuring and Müller, 2008). The theoretical framework established is demonstrated schematically in Fig. 11.

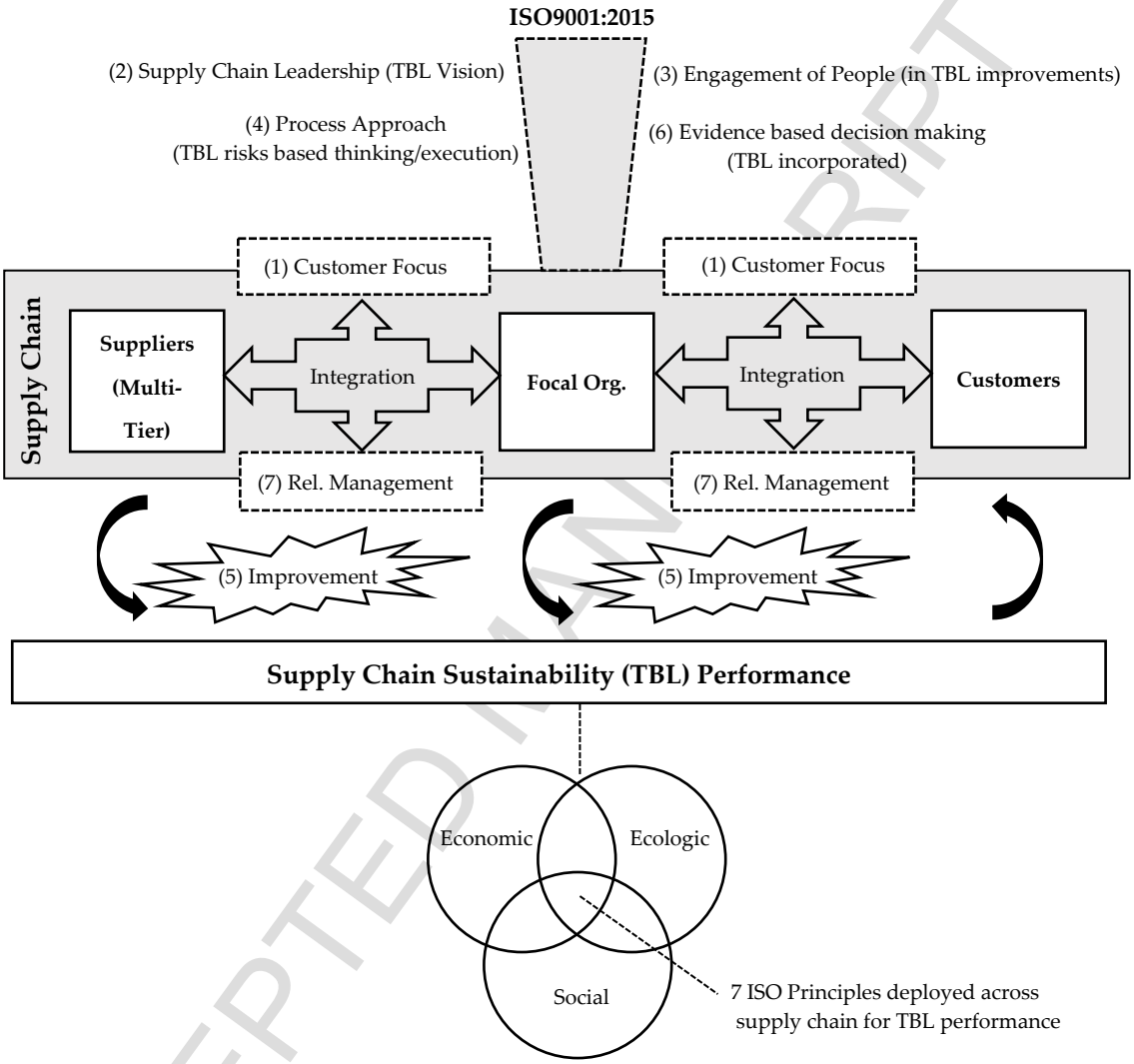


Fig. 11. SSCQM framework and its theoretical elements

Leadership is at the core of ISO9001 framework as well as the SSCM framework that requires the leaders at all levels to create conditions where all team members are engaged to deliver objectives of the organization (ISO, 2015). The leaders, through establishing the vision for sustainability improvements across the supply chain and ensuring high performing teams are engaged to deliver environmental and social objectives, will highly influence sustainability performance of supply chains. Leaders play a pivotal role in establishing a balanced view on sustainability in their organizations, incorporating triple bottom line into decision making processes and ensuring teams internal and external to organizations deliver triple bottom line performance in line with long term objectives.

Process approach principle provides achievement of consistent results through management of key activities as interrelated processes (ISO, 2015). The deployment of this principle not only allows identification of high risk activities internal to organizations but also establishment of high risk activities and associated interrelations in the supply chain. Through the risk based thinking, the organizations identify, prioritize and mitigate environmental and social sustainability risks across their supply chain.

Kuei and Lu (2012) identified factual and evidence based management as a critical factor for quality driven sustainability management systems. Evidence based decision making principle stems from making decisions based on analysis of reliable information and data (ISO, 2015). Through this principle, organizations can embed sustainability impact assessments into their supply chain decision making processes, making decisions and deploying strategies that are more likely to result in multi-dimensional sustainability improvements.

Improvement principle ensures ongoing focus on innovation and capability development (ISO, 2015). Through embedding the improvement principle internally and across the supply chain, organizations drive innovation on environmental and social sustainability with their suppliers and customers on an ongoing basis, resulting in TBL performance improvements.

Zink (2007) defined engagement of people as an essential parameter for organizational sustainability performance improvement. Engagement of people principle includes involvement, recognition and empowerment of team members in achieving organizational goals (ISO, 2015). Through engagement of people within the organizations and across the supply chain, social sustainability performance is impacted positively through increased job satisfaction, enhanced motivation, human resource development and increased morale. Through involving and raising awareness of team members at all levels across the supply chain network in sustainability initiatives, enhanced utilization of resources are achieved through waste elimination. Innovation is driven through empowered teams for more environmentally and socially friendly products, services, processes and supply chains.

Seuring and Müller (2008) defined customer pressures as a key driver for implementation of sustainability practices in the supply chain. At the center of the customer focus principle lies meeting customer requirements and exceeding customer expectations (ISO, 2015). Considering the growing market pressures for more sustainable products, services and processes, organizations are driven to deliver social and ecological improvements across their supply chains through this principle.

Relationship management principle requires management of relationships with important interested parties including suppliers for sustained business success (ISO, 2015). Agi and Nishant (2016) identified relationship management between supply chain members as a highly influential factor for GSCM implementation and environmental sustainability. Through adopting this principle across the supply chain, key suppliers with environmental and social impact are identified, collaborative initiatives established, and triple bottom line improvements realized.

As set out in Section 3.2.2., SSCM literature echoes that information flow, coordination, collaboration and connection across the supply chain network is key to achieve higher levels of organizational and overall supply chain sustainability performance (Ashby et al., 2012; Beske and

Seuring, 2014; Liebetruth, 2017; Rajeev et al., 2017; Reefke and Sundaram, 2016; Winter and Knemeyer, 2013; Yu Xia, 2011). Robinson and Malhotra (2005) and Flynn et al. (2010) put forward that supply chain integration is associated with business process efficiency and effectiveness. Increased design capability, process efficiency and enhanced internal / cross enterprise cooperation positively influences environmental sustainability due to greener product / process / service engineering practices and diminished waste generation, consumption levels (Sueyoshi and Wang, 2014). Social and ecologic supply chain sustainability benefits are introduced through identification and development of suppliers with higher impact. Team members of all supply chain network benefit positively from the increased information flow, contributing towards improvements in training, competence, empowerment, health and safety, resulting in associated social sustainability enhancements.

3.3.2. Road map for implementation and operationalisation

The framework presented entails several practical implications for industrial practitioners, senior managers and decision makers in line with the operationalization steps presented in Fig. 12. The road map utilizes the PDCA structure due to its established support and facilitation for implementation of sustainability improvement initiatives (Kuei and Lu, 2012; Rusinko, 2005). The initiation step for any business process diagnostics and strategy deployment activity is identification of maturity levels of the principles under investigation (Garza-Reyes et al., 2015). The maturity level refers to the support structure, procedures, processes, resource commitments and degree of knowledge in the business along with deployment effectiveness of the principles (Garza-Reyes et al., 2015). The gauging of maturity levels with reference to each principle will enable industrial practitioners to establish current state in their organizations and associated supply chains, allowing determination of gaps, risks and opportunities.

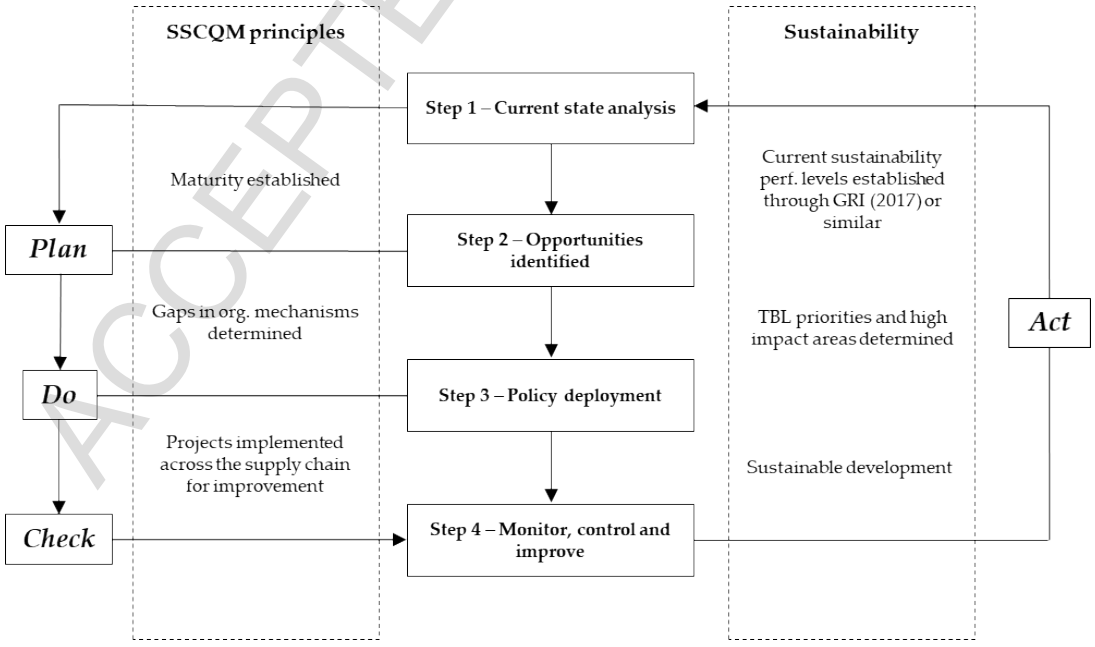


Fig. 12. Road map for implementation and operationalisation

The literature definitions in relation to organizational indicators of the seven QM principles and supply chain integration principle can be utilized as a reference point during the benchmarking process to facilitate measurement of level of implementation and maturity (Chang et al., 2016; ISO, 2015). Through adoption of sustainability performance measurement models in the literature such as Chardine-Baumann and Botta-Genoulaz (2014) or business reporting standards such as GRI (2017), current triple bottom line performance can also be established. This will provide the decision makers with a holistic picture of where their organizations are with reference to sustainability synergistic QM and SCM principle deployment levels and current sustainability performance levels. Post establishment of current state, areas with high impact on triple bottom line and areas requiring improvement in the organisation are determined, confirming improvement priorities from an organizational and supply chain perspective.

Ultimately, all parameters of environmental, social and economic sustainability are required to be measured and improved by all members of the supply chain to enable sustainable development and higher levels of supply chain sustainability. Stemming from the insights and visibility obtained from the current state and maturity level analysis, key stakeholders of the supply chains are also required to be engaged to reinforce sustainable development activities through increased collaboration, enhanced information sharing and synergistic policies.

4. Discussion

4.1. Sustainable Supply Chain Quality Management – an emerging research field

Several key deductions were made from the quality management, supply chain management and sustainability management integration literature review including:

- QM and SCM integration offers significant potential for organizations including focal business and overall supply chain performance improvements.
- Integration of triple bottom line (financial, environmental and social considerations) into SCM and other business processes is a remarkable gap that needs to be addressed by all future sustainability management research streams.
- The relationships between QM and three pillars of sustainability in the context of supply chain is a fruitful area to be explored. This may reveal an ultimate, sustainability management framework that is continuously improved through QM principles and deployed across the supply chain through SCM principles.

Kuei et al. (2011) designed and validated a global SCQM model through an empirical case study, strongly suggesting future research to incorporate sustainability dimensions into future SCQM modelling studies. Fernandes et al. (2017), in their state of the art research study, proposed a conceptual supply chain quality management model, combining quality and supply chain management principles for organizational performance improvement. As part of Fernandes et al. (2017) SCQM model, sustainability is also identified as a key supply chain factor however, the relationships between the QM, SCM, SCQM practices and sustainability indicators have not been defined. The potential effects of such an SCQM model on organizational triple bottom line

(ecologic, economic and social sustainability) performance have not been considered. Fernandes et al. (2017) SCQM model can be considered as the first SCQM model to incorporate sustainability even though, the links with three pillars of sustainability and the expected influence of SCQM on triple bottom line are missing. SSCM research was also observed to follow a similar path towards full integration, authors such as Govindan et al. (2014) and Agi and Nishant (2016) including QM principles as well as SCM practices and sustainability in their conceptual frameworks, empirically confirming positive relationships.

Taking into account the historical evolution and the extant integration trends among quality, supply chain, sustainability approaches along with the future research directions indicated in key literature above, the emergence of a new research field, sustainable supply chain quality management (SSCQM) is foreseen as outlined below in Fig. 13. This new field is expected to expand on the strengths, synergies and relationships established between quality, supply chain and sustainability management practices, contributing towards the journey of true sustainability practice developments and enhancements across the full supply chain network.

The theoretical framework presented in Section 3.3. stems from the gaps, opportunities and benefits identified in the literature. The constructed conceptual framework not only builds on the high potential of the QM principles for organizational sustainable development but also seeks to achieve total supply chain sustainability improvements through the reinforcement of supply chain integration principle, which is defined as the building block of SSCM. In the light of the framework presented and the road map for implementation, industrial practitioners are encouraged to undertake gap analyses across their supply chains and direct strategy deployment in line with the QM and SCM principles set out as sustainability synergistic.

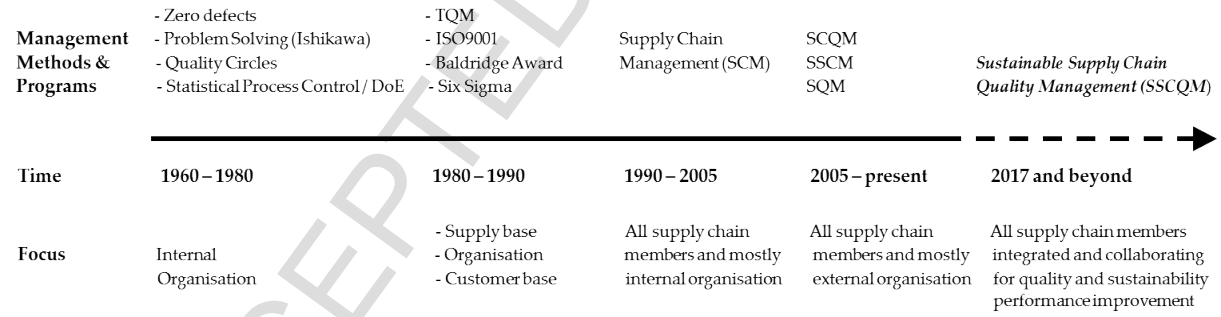


Fig. 13. Evolution of SCM, QM, SM, integration and the inception of a new research area: SSCQM (Adapted from Robinson and Malhotra (2005))

4.2. Limitations and Future Research Directions

Peer reviewed articles from main databases identified as central to QM, SCM and sustainability literature were considered in this review, which may have limited the number of articles included and scope of this investigation to a certain extent. However, these measures were taken to ensure the quality of the publications included in the review and the large sample size of papers considered (93 articles) brought together a holistic view and significant reliability for our findings. Moreover, the adoption of higher level searching protocols i.e. QM, SCM and sustainability during the establishment of SQM, SSCM and SCQM research themes can also be

reflected on as a limitation although, the searching protocols identified articles covering a wide range of sustainability integration issues not limited to but including GSCM, quality management based eco-design, planning of sustainable supply chains, enablers of SSCM and performance measurement of SSCM. On the other hand, all keywords fundamental to QM, SCM and sustainability were included in search 4 in line with the scope and objectives of this study, addressing the existent gap in the literature i.e. development of a holistic and collective view of SSCQM.

In this study, the worldwide quality management system framework, ISO9001:2015 principles, supported with the fundamental SCM principle of supply chain integration, were expanded to capture the full supply chain view and relationships identified with three pillars of sustainability. A future research avenue for SCM, QM and sustainability integration research is the investigation of relationships of other SCQM practices and principles with specific sustainability dimensions (e.g. supplier quality management and impacts on supply chain sustainability performance), incorporating triple bottom line into future SCQM models. This study attempted to define an initial conceptual framework, associating QM principles and supply chain integration with sustainability. Future theoretical contributions may elaborate on this framework through establishment of supply chain specific indicators (measurables specific to focal organisation, suppliers and customers) of sustainability and identification of organizational indicators of the SSCQM construct with a view to support operationalization. Incorporation of sustainability reporting standards such as GRI (2017) is another fruitful research avenue that will not only support empirical testing of the relationships identified but also possesses the potential of contributing towards development and deployment of sustainability measurement standards for industries globally.

From an empirical perspective, different geographical regions and business sectors are suggested for exploration to verify and validate the relationships identified in this paper. Empirical studies, utilizing mixed methods are particularly encouraged, considering the highly limited, mixed empirical evaluations undertaken to date, on the basis that significantly more reliable and deeper insights are likely to be introduced from the adoption of such methodology for management integration research (Leech and Onwuegbuzie, 2009; Tranfield et al., 2003).

5. Conclusions

In this paper, a systematic review of the quality management, supply chain management and sustainability management integration literature was undertaken, with a view to explore unrevealed potential for integration. 93 papers were identified as relevant to this review between 2005 and June 2017. The descriptive statistics of the literature were provided along with the key themes covering the integration research streams, presented in a concept map format. Significant benefits of integrating quality and supply chain management were established including performance improvements and integration increasing the effect of both methodologies. Integration of sustainability into quality and supply chain management was seen to be a highly emerging area with multi-dimensional (financial, ecologic and social) approaches still very much required to enable more sustainable organizations and supply chains for our society. In the light of this in-depth review, a new, emerging research area was revealed: sustainable supply chain quality

management (SSCQM). An initial theoretical framework was provided to guide future theory building on this promising research area, building on the integration potential of quality management across the supply chains and incorporating triple bottom line for sustainability improvements.

The theoretical framework presented established synergistic relationships between the widely accepted principles of the international quality management standard ISO9001:2015, key SCM principle of supply chain integration and three pillars of sustainability. This framework is expected to not only indicate the significant potential of the emerging research avenue of SSCQM but also to pave the path for industrial practitioners and decision makers for global supply chain sustainability improvement. All in all, the model described in this contribution is a conceptual proposal that is subject to further enhancements and empirical validation.

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Appendix – List of Articles included in the Literature Review

The list of articles included in the systematic literature review have been provided in Table A1 below:

Table A1. Articles included in the literature review.
(SCQM – Blue (40 Papers), SSCM – Red (37 Papers), SQM – Green (11 Papers), SSCQM – Gold (5 Papers))

Author(s)	Title	Publisher
Azizi et al. (2016)	The impact of knowledge management practices on supply chain quality management and competitive advantages	Degruyter
Carmignani (2009)	Supply chain and quality management: The definition of a standard to implement a process management system in a supply chain	Emerald
Casadesús and de Castro (2005)	How improving quality improves supply chain management: empirical study	Emerald
Chadha and Gagandeep (2013)	Empowering Quality Management Systems Through Supply Chain Management Integration: A Survey of Select Hospitals in Chandigarh, Mohali and Panchkula	IUP
Chen et al. (2014)	Quality control in food supply chain management: An analytical model and case study of the adulterated milk incident in China	Elsevier
Fernandes et al. (2017)	Supply chain management and quality management integration: A conceptual model proposal	Emerald
Flynn and Flynn (2005)	Synergies between supply chain management and quality management: emerging implications	T & F
Foster (2008)	Towards an understanding of supply chain quality management	Elsevier
Foster and Ogden (2008)	On differences in how operations and supply chain managers approach quality management	T & F
Fynes et al. (2005)	The impact of supply chain relationship quality on quality performance	Elsevier
Gu et al. (2017)	Management Practice of Supply Chain Quality Management in Service-oriented Manufacturing Industry	Matec
Jiang et al. (2010)	Research on Quality Management System for Supply Chain Based-Customer Satisfaction	IEEE
Jraisat and Sawalha (2013)	Quality control and supply chain management: a contextual perspective and a case study	Emerald
Azar et al. (2010)	Relationship between supply chain quality management practices and their effects on organisational performance	Gale
Kannan and Tan (2005)	Just in time, total qualitymanagement, and supply chain management: understanding their linkages and impact on business performance	Elsevier
Kaynak and Hartley (2008)	A replication and extension of quality management into the supply chain	Elsevier
Kuei et al. (2008)	Implementing supply chain quality management	T & F
Kuei et al. (2011)	Developing global supply chain quality management systems	T & F
Lin et al. (2005)	A structural equation model of supply chain quality management and organizational performance	Elsevier
Lin et al. (2013)	Identifying critical enablers and pathways to high performance supply chain quality management	Emerald
Lou et al. (2009)	Production-Outsourcing Supply Chain Quality Management Based on Multi-Agent System	IEEE
Mahdiraji et al. (2012)	Supply chain quality management	Gro. Sci.
Mellat-Parast (2013)	Supply chain quality management: An inter-organizational learning perspective	Emerald
Sun and Li (2010)	Study on Supply Chain Quality Management Model Based on Immune Theory	IEEE
Quang et al. (2016)	An extensive structural model of supply chain quality management and firm performance	Emerald
Robinson and Malhotra (2005)	Defining the concept of supply chain quality management and its relevance to academic and industrial practice	Elsevier
Sarrico and Rosa (2016)	Supply chain quality management in education	Emerald
Shalij et al. (2009)	Design of ISO 9001:2000 based Supply Chain Quality Management Systems	Indersci.
Sharma and Modgil (2015)	Supply chain and total quality management framework design for business performance-case study evidence	Emerald
Sharma et al. (2012)	Quality Management in Supply Chains: The Literature Review	Res. Gate
Sheikhy and Hamzeie (2015)	The relationship between total quality management and supply chain development of automotive companies listed in Tehran stock exchange	AENSI
Siddiqui et al. (2012)	The Impact of Supply Chain Management Practices in Total Quality Management Practices and Flexible System Practices Context: An Empirical Study in Oil and Gas Industry	Springer
Talib et al. (2010)	Integrating Total Quality Management and Supply Chain Management: Similarities and Benefits	IUP
Talib et al. (2011)	A study of total quality management and supply chain management practices	Emerald

Terziovski and Hermel (2011)	The Role of Quality Management Practice in the Performance of Integrated Supply Chains: A Multiple Cross-Case Analysis	Proquest
Vanichchinchai and Igel (2009)	Total quality management and supply chain management: similarities and differences	Emerald
Vanichchinchai and Igel (2010)	The impact of total quality management on supply chain management and firm's supply performance	T & F
Wang et al. (2010)	A Conceptual Modeling Approach to Quality Management in The Context of Diary Supply Chain	IEEE
Zeng et al. (2013)	Supply chain quality management practices and performance: An empirical study	Springer
Zhong et al. (2016)	Supply chain quality management: an empirical study	Emerald
Wan Ahmad et al. (2016)	Sustainable supply chain management in the oil and gas industry: A review of corporate sustainability reporting practices	Emerald
Ansari and Qureshi (2015)	Sustainability in Supply Chain Management: An Overview	IUP
Ashby et al. (2012)	Making connections: a review of supply chain management and sustainability literature	Emerald
Awudu and Zhang (2012)	Uncertainties and sustainability concepts in biofuel supply chain management: A review	Elsevier
Beske and Seuring (2014)	Putting sustainability into supply chain management	Emerald
De Brito and Van der Laan (2010)	Supply Chain Management and Sustainability: Procrastinating Integration in Mainstream Research	MDPI
Chardine-Baumann and Botta-Genoulaz (2014)	A framework for sustainable performance assessment of supply chain management practices	Elsevier
Genovese et al. (2015)	Sustainable supply chain management and the transition towards a circular economy: Evidence and some applications	Elsevier
Gold and Schleper (2017)	A pathway towards true sustainability: A recognition foundation of sustainable supply chain management	Elsevier
Grosvold et al. (2014)	Squaring the circle: Management, measurement and performance of sustainability in supply chains	Emerald
Halldórsson et al. (2009)	Supply chain management on the crossroad to sustainability: a blessing or a curse?	Springer
Jabbour et al. (2015)	Green supply chain management and firms' performance: Understanding potential relationships and the role of green sourcing and some other green practices	Elsevier
Khodakarami et al. (2015)	Developing distinctive two-stage data envelopment analysis models: An application in evaluating the sustainability of supply chain management	Elsevier
Liebetruth (2017)	Sustainability in performance measurement and management systems for supply chains	Elsevier
Lin (2013)	Using fuzzy DEMATEL to evaluate the green supply chain management practices	Elsevier
Luthra et al. (2015)	Critical success factors of green supply chain management for achieving sustainability in Indian automobile industry	T & F
Luthra et al. (2016)	The impacts of critical success factors for implementing green supply chain management towards sustainability: an empirical investigation of Indian automobile industry	Elsevier
Agrawal and Sharma (2015)	Supply Chain Social Sustainability: A Comparative Case Analysis in Indian Manufacturing Industries	Elsevier
Marshall et al. (2015)	Environmental and social supply chain management sustainability practices: construct development and measurement	T & F
Quarshie et al. (2016)	Sustainability and corporate social responsibility in supply chains: The state of research in supply chain management and business ethics journals	Elsevier
Rajeev et al. (2017)	Evolution of sustainability in supply chain management: A literature review	Elsevier
Reefke and Sundaram (2016)	Key themes and research opportunities in sustainable supply chain management – identification and evaluation	Elsevier
Schaltegger and Burritt (2014)	Measuring and managing sustainability performance of supply chains: Review and sustainability supply chain management framework	Emerald
Schmidt and Schwegler (2008)	A recursive ecological indicator system for the supply chain of a company	Elsevier
Seuring (2013)	A review of modeling approaches for sustainable supply chain management	Elsevier
Seuring and Müller (2008)	From a literature review to a conceptual framework for sustainable supply chain management	Elsevier
Seuring et al. (2008)	Sustainability and supply chain management – an introduction to the special issue	Elsevier
Silvestre (2015)	Sustainable supply chain management in emerging economies: Environmental turbulence, institutional voids and sustainability trajectories	Elsevier
Somsuk and Laosirihongthong (2016)	Prioritization of applicable drivers for green supply chain management implementation toward sustainability in Thailand	T & F
Stindt (2017)	A generic planning approach for sustainable supply chain management - How to integrate concepts and methods to address the issues of sustainability?	Elsevier
Sueyoshi and Wang (2014)	Sustainability development for supply chain management in U.S. petroleum industry by DEA environmental assessment	Elsevier
Tseng and Chiu (2013)	Evaluating firm's green supply chain management in linguistic preferences	Elsevier
Tsoulfas and Pappis (2008)	A model for supply chains environmental performance analysis and decision making	Elsevier

Türkay et al. (2016)	Sustainability in Supply Chain Management: Aggregate Planning from Sustainability Perspective	Plos
Winter and Knemeyer (2013)	Exploring the integration of sustainability and supply chain management: current state and opportunities for future inquiry	Emerald
Yu Xia (2011)	Sustainability in supply chain management: suggestions for the auto industry	Emerald
Zhu et al. (2006)	Green supply chain management: pressures, practices and performance within the Chinese automobile industry	Elsevier
Alemam and Li (2016)	Matrix-based quality tools for concept generation in eco-design	Sage
Aquilani et al. (2016)	Sustainability, TQM and Value Co-Creation Processes: The Role of Critical Success Factors	MDPI
Asif et al. (2011)	Including sustainability in business excellence models	T & F
Francis (2009)	Total Quality Management – A Tool for Design for Environment	IEEE
Siva et al. (2016)	The support of Quality Management to sustainable development: a literature review	Elsevier
Kuei and Lu (2012)	Integrating quality management principles into sustainability management	T & F
Maletic et al. (2011)	Can sustainable quality management contribute to the organizational performance?	Academic Journals
Rusinko (2005)	Using Quality Management as a Bridge to Environmental Sustainability in Organizations	SAM
Srdic and Selih (2011)	Integrated quality and sustainability assessment in construction: a conceptual model	T & F
Utne (2009)	Improving the environmental performance of the fishing fleet by use of Quality Function Deployment (QFD)	Elsevier
Zink (2007)	From total quality management to corporate sustainability based on a stakeholder management	Emerald
Agi and Nishant (2016)	Understanding influential factors on implementing green supply chain management practices: An interpretive structural modelling analysis	Elsevier
Dubey et al. (2015)	Exploring the relationship between leadership, operational practices, institutional pressures and environmental performance: A framework for green supply chain	Elsevier
Govindan et al. (2014)	Impact of supply chain management practices on sustainability	Elsevier
Jabbour et al. (2014)	Quality management, environmental management maturity, green supply chain practices and green performance of Brazilian companies with ISO 14001 certification: Direct and indirect effects	Elsevier
Fassoula (2005)	Reverse logistics as a means of reducing the cost of quality	T & F

Article Highlights:

- One of the few studies from the joint perspective of QM, SCM and sustainability.
- Integration increases the effect of both QM and SCM, facilitating improvement.
- TBL integration into QM and SCM is required for more sustainable supply chains.
- A new research area is revealed, integrating QM and TBL across the supply chain.
- An initial conceptual framework is provided for future theory building.

QM: Quality Management
SCM: Supply Chain Management
TBL: Triple Bottom Line